

PACIFIC HERRING STOCKS AND FISHERIES
IN THE EASTERN BERING SEA,
ALASKA, 1982

A Report to the North Pacific Fisheries Management Council

November 1982

Prepared by:

Stephen M. Fried,
Craig Whitmore,
and
Daniel Bergstrom

Alaska Department of Fish and Game
Division of Commercial Fisheries
333 Raspberry Road
Anchorage, Alaska 99502

This report summarizes current information on eastern Bering Sea Pacific herring stocks and fisheries within Alaskan waters. A more detailed account of this information is presented in Fried et al (1982).

COMMERCIAL FISHERIES

A total of 24,897 m.t. of Pacific herring were harvested in eastern Bering Sea Commercial Fishing Districts during 1982 (Figures 1 and 2, Table 1). This was the largest total harvest recorded since these fisheries began in the 1960's. Exploitation of estimated available spawning biomass was 21.5% (Table 2). Wastage of herring was estimated to be less than 500 m.t. for all Districts combined. Most documented wastage was due to storms and vessel mishaps rather than to dumping of unwanted herring. Numbers of buyers and fishermen increased in Togiak District, but decreased in all other Districts (Table 3). Spawn on kelp harvests in Togiak and Norton Sound Districts totaled 141.4 m.t. (Table 4). Value of total herring and spawn on kelp harvests to fishermen was estimated to be \$7.9 million.

A total of 2,939 m.t. of herring was also harvested in the vicinity of Unalaska Island during 1982 (Table 1). Studies are currently underway to determine whether herring harvested during this fishery belong to stocks which spawn and are harvested in Togiak, Security Cove or Goodnews Bay Districts.

SUBSISTENCE FISHERIES

A total of 97 m.t. of Pacific herring were harvested by 129 families from seven villages in the Nelson Island and Yukon-Kuskokwin Delta area (Table 5).

STOCK ASSESSMENT

Methods

Aerial surveys were conducted within all Fishing Districts, except Cape Romanzof, to determine relative abundance, distribution and estimated biomass of herring schools. Basic methods of data collection were similar to those used in previous years (Barton and Steinhoff 1980). A total of 172 hours was spent in aerial assessment of herring spawning stocks: 63 hours in Togiak, 28 hours in Security Cove/Goodnews Bay, 6 hours in Nelson Island and 75 hours in Norton Sound. In-season stock size estimates could only be made for Togiak and Norton Sound Districts due to weather and water conditions. Post-season estimates were made for the remaining Districts based upon catch rates and spawn deposition during the season (Table 6).

Availability of a chartered helicopter on the Togiak fishing grounds greatly aided test fishing, catch sampling, fishery monitoring and assessment activities. Unfortunately, mechanical failures prevented use of the helicopter during most of the time period chartered purse seine vessels were available; tonnage data on only one herring school was obtained during the season (Table 7). Conversion factors of 1.2 (water depth 5 m or less), 2.5 (water depth greater than 5 m) and 3.0 (water depth greater than 8 m) per 50 m² school surface area were used in analysis of Togiak District aerial survey data. Conversion factors of 2.4 or 3.1 m.t./50 m² were used for all other Districts.

Test fishing with variable mesh gillnets and sampling of commercial landings were conducted in all Fishing Districts to determine age, size and sexual maturity of herring. Additionally, chartered purse seine vessels were used to collect herring samples within Togiak District. A total of 10,739 herring was sampled during 1982.

Results

Spawning populations in most Districts were lower than those observed in 1981 (Table 6). A total of 119,600 m.t. of herring was estimated to have been present during the 1982 spawning season. Spawn deposition was similar to that observed in 1981, with totals of 66, 8 and 37 linear km of milt sighted during aerial surveys in Togiak, Security Cove and Norton Sound Districts, respectively. Age composition analyses indicated that five year old herring (1977 year class) comprised 55% of the total spawning population (Figures 3 and 4). Four year old herring (1978 year class) comprised 18% of the spawning population.

Peak periods of herring abundance occurred 19-23 May in Togiak District, 25-30 May in Security Cove and Goodnews Bay Districts, and 6-14 June in the various Subdistricts of Norton Sound District. Ice and cold water temperatures delayed inshore migration and onset of spawning as compared to 1980 and 1981 in all Districts.

OUTLOOK FOR 1983

Based upon a moderate recruitment of four year old herring and the continued large returns of five year old herring in 1982, the Department of Fish and Game anticipates a harvestable surplus of herring to be available in all Districts in 1983. However, since no methods are available to reliably forecast actual returns (or to estimate recruitment), harvest levels will be adjusted during the season according to observed herring biomass. If it is not possible to determine herring abundance by using aerial surveys, stock condition will be assessed using information from test and commercial catches along with spawn deposition observations.

Although increased use of collected fishery statistics in mathematical models may provide useful information for predicting abundance trends of herring populations, further work is needed to refine real time stock assessment techniques. Offshore hydroacoustic and trawl surveys coupled with stock identification studies could provide pre-season stock size estimates. Underwater telemetry or tagging studies could provide needed information on herring movement patterns and spawning ground residence time to refine in-season stock size estimates. Inshore hydroacoustic surveys could provide a more cost effective method of obtaining conversion factor estimates than using chartered purse seine vessels.

LITERATURE CITED

- Barton, L.H. and D.L. Steinhoff. 1980. Assessment of spawning herring (Clupea harengus pallasii) stocks at selected coastal areas in the eastern Bering Sea. Alaska Department of Fish and Game Informational Leaflet No. 187. 60 p.
- Fried, S.M., C. Whitmore and D. Bergstrom. 1982. Pacific herring stocks and fisheries in the eastern Bering Sea, Alaska, 1982: A report to the Alaska Board of Fisheries. Alaska Department of Fish and Game mimeo. 30 p.

Table 3. Commercial harvest of Pacific herring spawn on rockweek kelp
in eastern Bering Sea Fishing District, Alaska, 1978-1982.

	District	Harvest (m.t.)	Number of Buyers	Number of Pickers	Estimated Value (Dollars)
<u>1982</u>					
	Togiak	106.5	8	214	176,193
	Norton Sound	34.9	1	74	57,585
	Total	141.4			233,778
<u>1981</u>					
	Togiak	171.9	7	108	250,000
	Norton Sound	37.2 1/	4	22	45,000 2/
	Total	209.1			295,000
<u>1980</u>					
	Togiak	86.0	21	78	94,600
	Norton Sound	22.2	1	20	73,000
	Total	108.2			167,600
<u>1979</u>					
	Togiak	188.0	16	100	248,160
	Norton Sound	11.8	1	19	15,576
	Total	199.8			263,736
<u>1978</u>					
	Togiak	149.6	11	160	119,800
	Norton Sound	3.4	1	0	2,723
	Total	153.0			122,523

1/ Does not include 5 m.t. dumped.

2/ Only 14 m.t. marketed, rest lost during tender accident.

Table 4. Numbers of buyers and fishermen participating in eastern Bering Sea Pacific herring fisheries, Alaska, 1978-1982.

District	Number of Buyers	Number of Fishermen 1/	
		Gillnet	Purse Seine
<hr/>			
1982			
Togiak	33	200	135
Security Cove	3	107	*
Goodnews Bay	3	84	*
Cape Romanzof	2	75	*
Norton Sound	7	237	*
<hr/>			
1981			
Togiak	28	106	83
Security Cove	7	113	*
Goodnews Bay	5	175	*
Cape Romanzof	4	111	*
Norton Sound	13	332	*
<hr/>			
1980			
Togiak	27	363	140
Security Cove	8	175	*
Goodnews Bay	4	165	*
Cape Romanzof	2	69	*
Norton Sound	8	294	*
<hr/>			
1979			
Togiak	33	350	175
Security Cove	2	61	*
Goodnews Bay	1	41	*
Cape Romanzof		No Fishery Conducted	
Norton Sound	7	50	17
<hr/>			
1978			
Togiak	16	40	25
Security Cove	3	-	-
Norton Sound	1	11	-

** Purse seine gear prohibited.

1/ Refers to # of vessels enumerated during aerial surveys in Togiak District.

Table 5. Subsistence herring catch (in metric tons) and effort data by selected areas, eastern Bering Sea, Alaska, 1975-1982. 1/

Village	1975	1976	1977	1978	1979	1980	1981	1982
Nelson Island								
Tununak	19.8	13.9	51.9	34.6	31.0	59.2	36.0	43.8
Umkumiut	30.0	8.5	2.8	10.4	7.5	3.1	9.0	0
Toksook Bay	31.0	31.8	19.3	33.5	46.5	26.6	13.0	31.6
Total	80.8	61.2	74.0	78.5	85.0	88.9	58.0	75.4
Number of Fish- ing Familes	109	42	90	83	54	70	93	65
Yukon-Kuskokwim Delta								
Scammon Bay	-	0.6	-	0.6	5.4	2.8	6.9	3.5
Chevak	-	0.6	0.1	-	2.1	3.2	1.7	1.8
Hooper Bay	2.5	2.7	2.1	3.5	2.8	3.3	3.6	4.2
Kwigillingok	-	9.6	0.9	-	7.2	12.0	-	12.0 2/
Total	2.5	13.5	3.1	4.1	17.5	21.3	12.2	21.5
Number of Fish- ing Families	34	49	39	29	106	80	45	64
Areas Combined								
Total Catch	83.3	74.7	77.1	82.6	102.5	110.2	70.2	96.9
Number of Fish- ing Families	143	91	129	112	160	150	138	129

1/ Other areas with small catches have been surveyed irregularly (1975-1978 estimated total coastal yearly subsistence catch averaged 100 m.t.).

2/ Estimate based on post season observations.

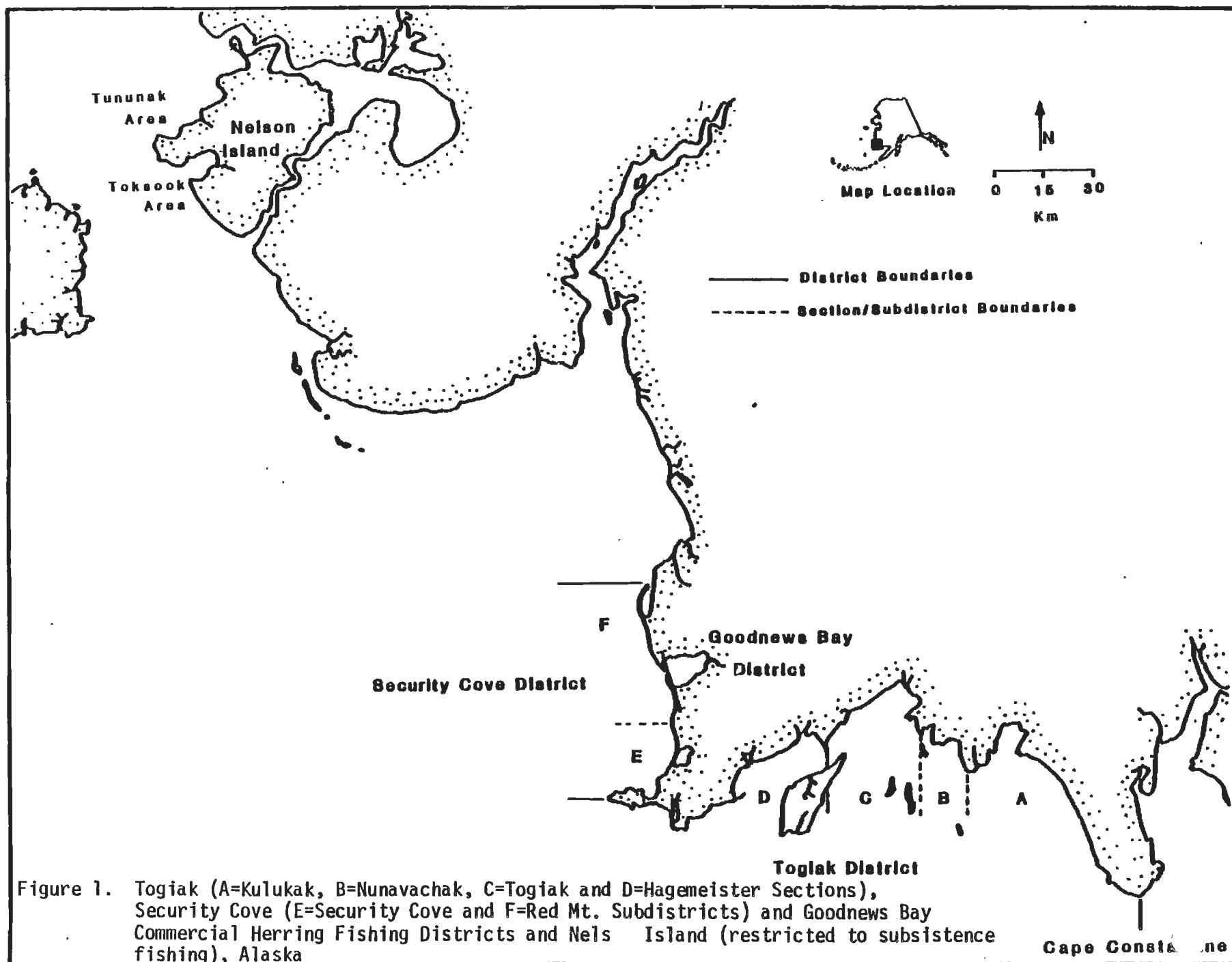
Table 6. Relative abundance index (RAI) and estimated biomass of eastern Bering Sea herring, Alaska, 1978-1982.

District	1978	1979	1980	1981	1982
Relative Abundance Index (RAI) 1/					
Togiak	43,050	137,630	15,249	79,352	49,998
Security Cove	246	2,912	435	2,228	486
Goodnews Bay	241	3,729	3/	1,593	3/
Nelson Island	1,079	3/	3/	1,072	3/
Cape Romanzof	539	3/	3/	4/	4/
Norton Sound	1,277	1,860	2,242	6,516	4,548
Total	46,432	146,131+	17,926+	90,761+	55,032+
Estimated Biomass in m.t. 2/					
Togiak	172,600	216,800	62,300	143,900	88,800
Security Cove	1,200	19,500	1,100	7,500	4,600
Goodnews Bay	400	6,700 3/	1,100 3/	3,900	2,400
Nelson Island	5,400	5,400 3/	5,400 3/	3,600	3,600
Cape Romanzof	2,700	2,700 3/	2,700 3/	4,400 4/	4,400
Norton Sound	4,800	7,000	7,600	20,800	15,800
Total	187,100	258,100	80,200	186,100	119,000

- 1/ Number of fish schools equivalent to 50 m surface area, unadjusted for presence of non-herring pelagic species.
- 2/ Adjusted for presence of non-herring pelagic species. Estimates for 1978 and 1979 represent low end of estimate ranges from Barton and Steinhoff (1980), 1980 estimates from Kingsbury (1980).
- 3/ Incomplete data due to inclement weather and/or turbid waters, biomass estimates are questionable and are based on 1978, 1979 or 1981 data.
- 4/ No aerial surveys made, 1981 estimate based upon assumption that commercial harvest represented 15 percent of total biomass; 1981 estimate used for 1982.

Table 7. Conversion estimates (metric tons of Pacific herring per 50 m² school surface area) obtained from test purse seine fishing, Togiak District, Alaska, 1978-1982.

Year	Water Depth (m)	Biomass per RAI unit	(m.t./50 m)
1981	2	1.1	Catch Landed
1980	3	1.2	Catch Landed
1980	5	1.1	Catch Landed
1980	5	1.2	Catch Estimated in Net
1979	6	2.4	Catch Landed
1980	6	3.0	Catch Estimated in Net
1980	6	2.6	Catch Estimated in Net
1981	6	1.7	Catch Landed
1980	8	1.6	Catch Estimated in Net
1981	8	4.0	Catch Landed
1982	8	1.9	Catch Estimated in Net
1978	?	6.7	Catch Estimated in Net
1978	?	11.0	Catch Estimated in Net



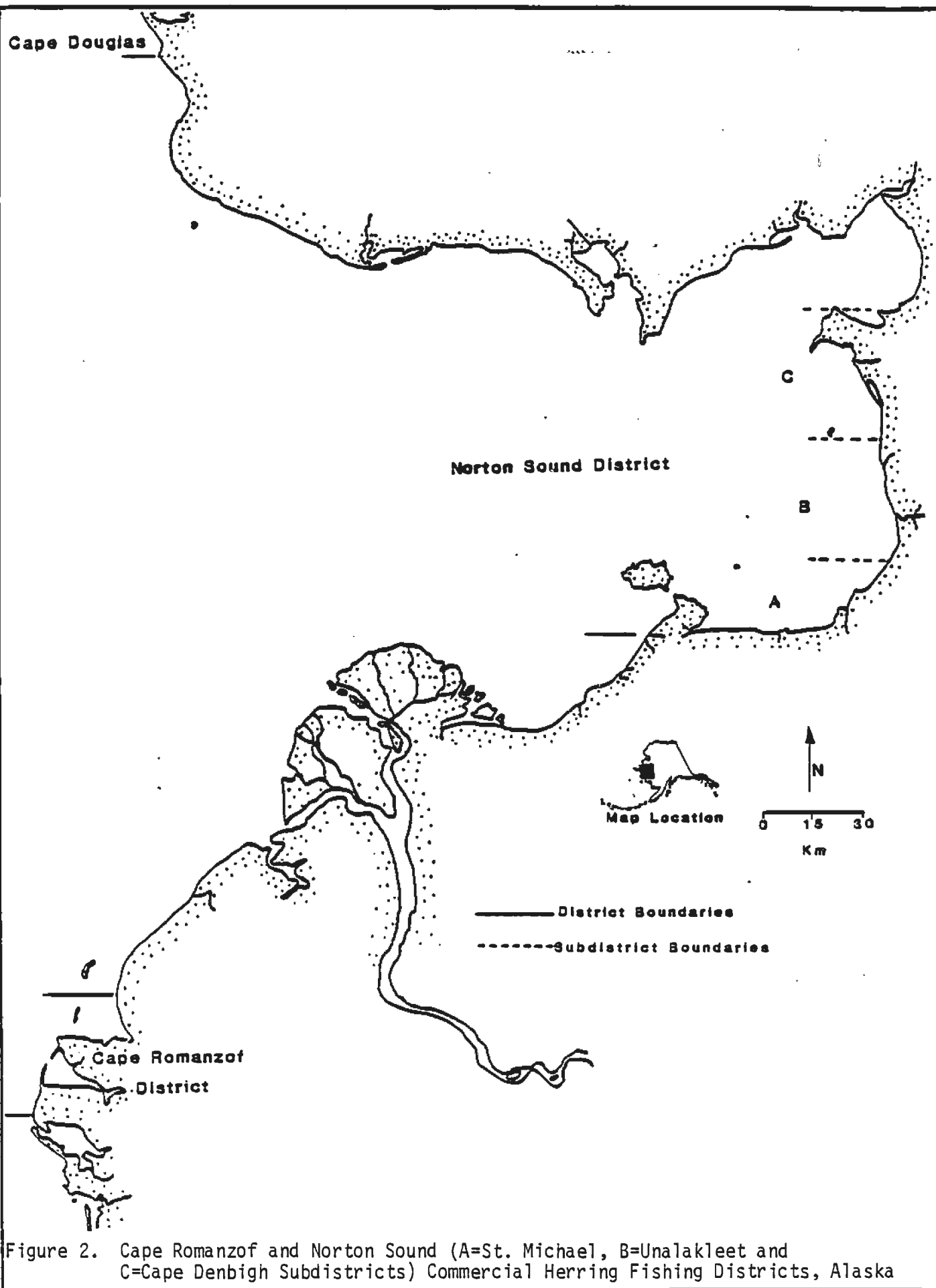


Figure 2. Cape Romanzof and Norton Sound (A=St. Michael, B=Unalakleet and C=Cape Denbigh Subdistricts) Commercial Herring Fishing Districts, Alaska

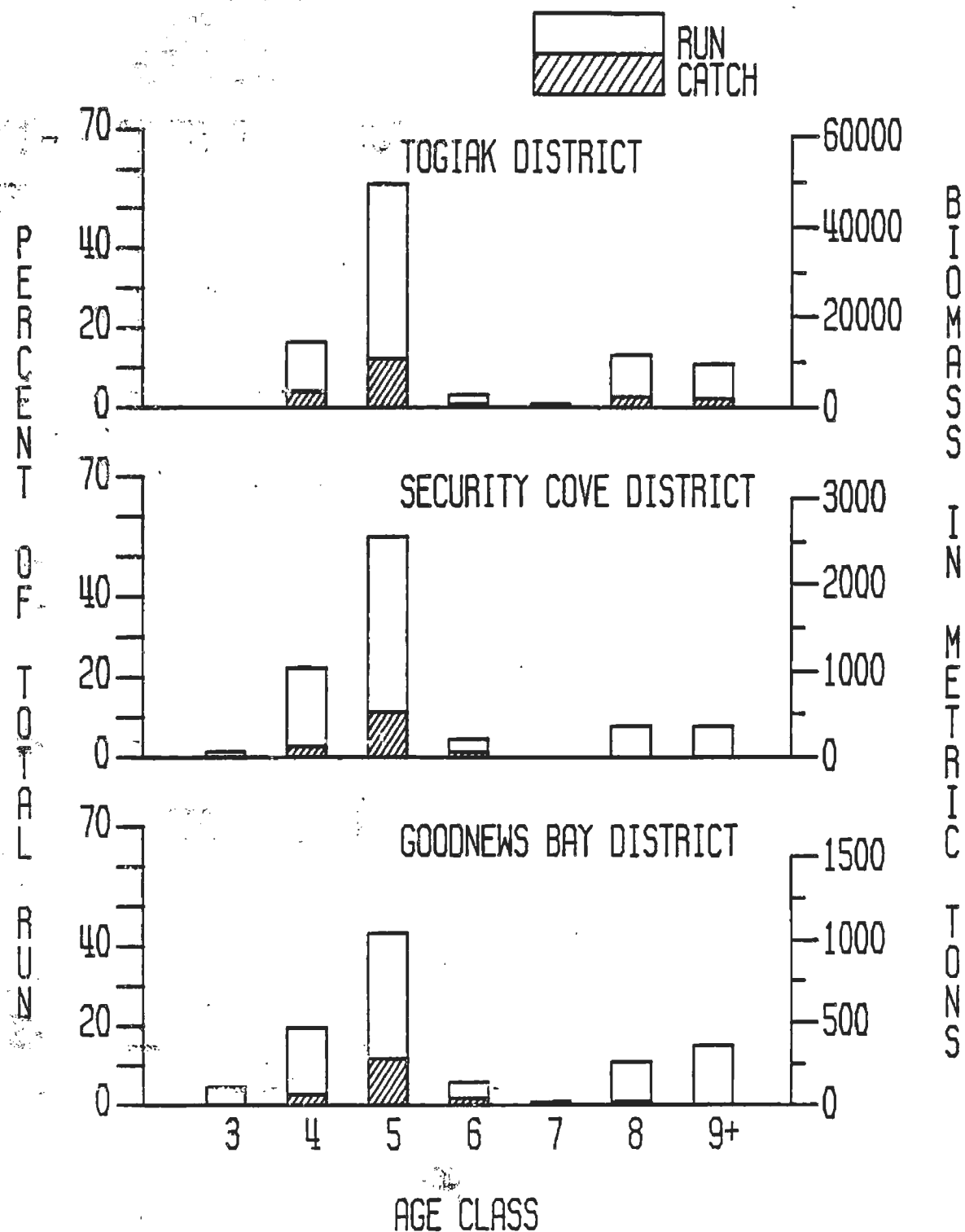


Figure 3. Age composition of Pacific herring in spawning populations and commercial harvests in Togiak, Security Cove and Goodnews Bay Commercial Herring Fishing Districts, Alaska 1982.

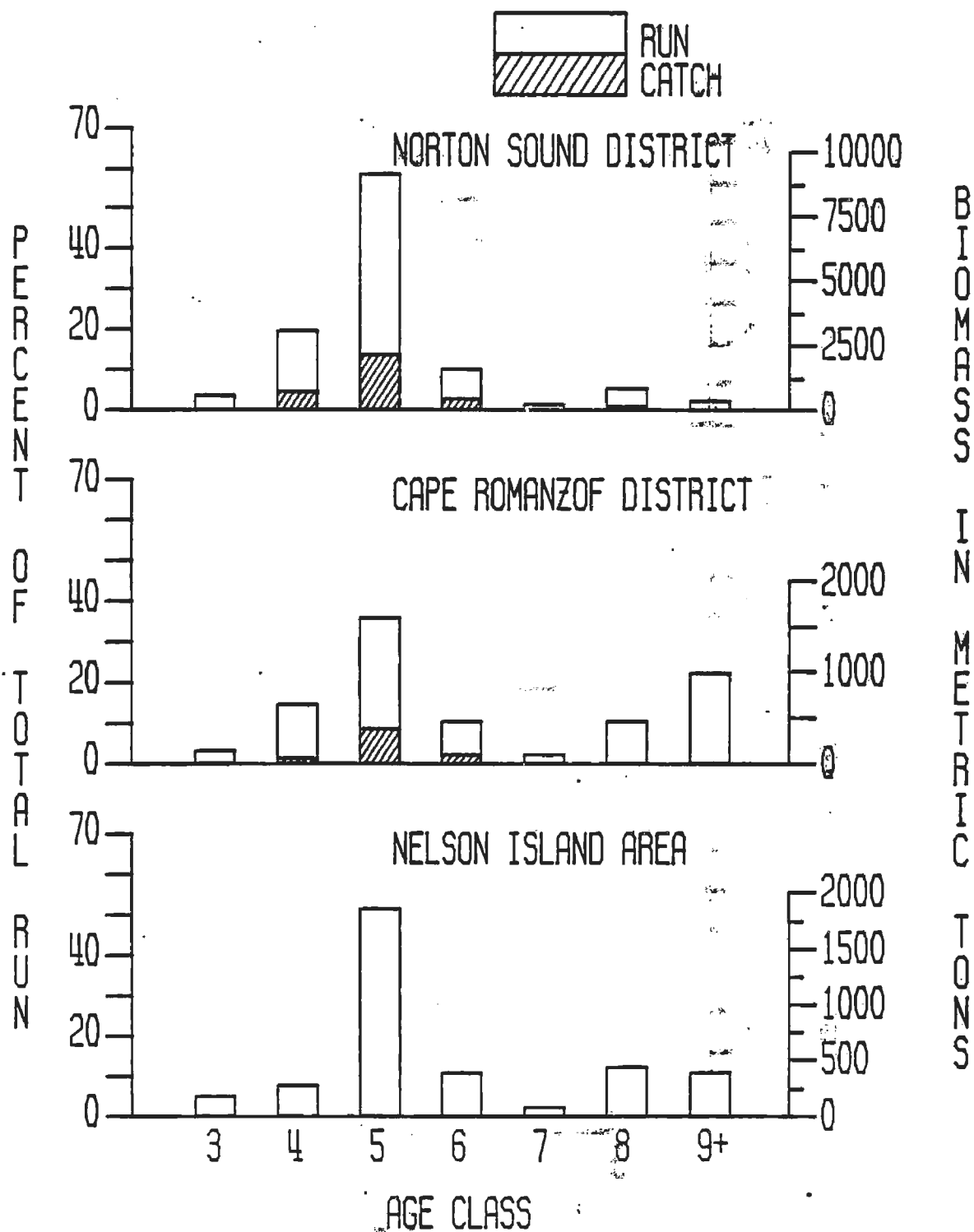


Figure 4. Age composition of Pacific herring in spawning populations and commercial harvests in Cape Romanzof and Norton Sound Commercial Herring Fishing Districts and the Nelson Island area, Alaska, 1982.

